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## INTRODUCTION

The percentage of females in the military services has steadily increased since the enactment of Public Law 90-130 in 1967. Currently, women comprise 11.8% of all active duty military personnel (203,703 women) and 12.3% of all Army personnel (71,640 women).<sup>54</sup> Among these women, it has been estimated that approximately 10% of all military females and 9% of Army females are pregnant at any one time.<sup>26</sup> This large cohort of pregnant service members has unique needs that require adjustments in the demands placed on it in a military environment.

### **Fitness**

Some allowances, particularly as they relate to fitness training, have been made for service members during the postpartum period. In the Army, postpartum soldiers receive 42 days of convalescent leave (CVL) and then return to their military job without limitations. They then perform physical training (PT), not at the same pace and distances of the soldiers in their unit, but at their own pace and distance (FM 21-20; 40-501) for the next 90 days. After 135 days post delivery, the postpartum soldier must meet the weight/body fat standards outlined in AR 600-9, as well as pass the Army Physical Fitness Test (APFT) required of all soldiers. These expectations for work performance, fitness and body weight/fat standards have never been scientifically examined to determine if they are achievable for the postpartum population. Thus far, no one has determined when postpartum women, either military or civilian, return to their prepregnancy work capacity or fitness level.

Differences in aerobic capacity between the pregnant and postpartum state have been examined<sup>20,21,40</sup>. Generally, women demonstrate little or no difference in oxygen uptake or aerobic capacity during submaximal exercise when comparing their pregnant and postpartum states<sup>20,40</sup>. As a result of these findings, many have concluded that pregnancy has no adverse effect on fitness in the postpartum period.<sup>20,21,40</sup> The problem with these studies is that postpartum measures were used as the baseline with the assumption that postpartum fitness matches that of the prepregnant state. However, when body composition, energy expenditure and maximal oxygen uptake are measured prior to conception and 8 weeks postpartum, a detraining is noted that is reflected by increased in body weight, decreased energy expenditure and lower oxygen uptake compared to the prepregnancy state.<sup>51</sup> In addition, cardiovascular changes in response to pregnancy, such as increased end-diastolic volume, stroke volume, and cardiac output; and decreased systemic vascular resistance, carry over into the postpartum state.<sup>7</sup>

### **Injury**

The effect of reduced fitness on postpartum soldiers, at the time they are required to return to duty, is unknown. Training-related injuries, a leading cause of morbidity in the U.S. Army,<sup>17,29,31</sup> are consistently higher in both male and female soldiers who have low levels of physical fitness. These injuries result in medical clinic visits and time lost from military duties,

(Table 1).<sup>3,30,31,33,36,47,48</sup> These elevated injury rates may rise further during the puerperium as a result of the negative effect of pregnancy upon fitness.

Poor calcium and bone status resulting from pregnancy, reduced physical activity and lactation may lead to increased incidence of bone-related training injuries such as stress fractures.<sup>42</sup> In the third trimester, the maternal system provides approximately 200 mg of calcium per day for fetal development.<sup>43</sup> Often, calcium is mobilized from bone to meet this large requirement<sup>43,52,58</sup>. Decreased bone mineral densities due to bone demineralization to meet pregnancy requirements have been noted in susceptible skeletal regions (eg. lumbar spine, femoral neck) following pregnancy.<sup>43</sup>

Reduced physical activity is another factor relevant to bone status in pregnant soldiers. As pregnancy progresses, physical activity and exercise become increasingly difficult. Women who become more sedentary, relative to their prepregnancy activity state, may reduce the stress placed on their bones and thereby diminish their bone strength.<sup>18</sup>

Finally, lactation represents an additional state which may affect bone mineral density. The calcium drain for milk synthesis is large, similar to that for fetal growth during late gestation.<sup>43,58</sup> In addition to the high calcium requirements for milk synthesis, endocrine factors may also negatively affect bone calcium. Lactational amenorrhea may last from three months to over three years, depending on the duration of lactation and pattern of breast feeding.<sup>41</sup> During this period, ovarian estrogen production is very low and a state of hypoestrogenemia exists. Hypoestrogenism is a major contributor to bone demineralization.<sup>18</sup> Additionally, plasma prolactin concentrations are elevated during lactation<sup>41</sup>, a condition that also is associated with bone mineral loss.<sup>58</sup>

### **Weight Loss**

Until recently, the usual recommendation for pregnancy weight gain in healthy women has been 24 to 28 lbs (11 to 13 kg), with no consideration given to prepregnancy weight.<sup>28</sup> However, the Institute of Medicine (IOM) has now issued new guidelines for weight gain based upon prepregnancy weight for height (Table 2). Delivery results in an average weight loss of 12 lbs (5.5 kg). Most women lose weight steadily following delivery over the first 3 to 6 months, with the greatest loss in the first three months.

Once lactation is begun, moderate dieting to achieve a weight loss of 4.5 lbs/mo (2 kg/mo) has been found to be safe for women who are overweight initially. However, women who are already lean may be at risk for impaired lactation performance if energy intake is <7.53 MJ/d (1800 kcal/d). The Army expects their postpartum soldiers to meet the weight/body fat standards after 135 days following delivery. That can be a challenge for most lean and some normal weight-for-height females given the above information. Much of the literature addressing postpartum weight loss is dated and limited. Four of the more recent investigations (2 comparing weight loss in the puerperium with first trimester weight<sup>20,50</sup> and 2 comparing weight loss in puerperium with prepregnancy weight<sup>11,51</sup>) showed a mean net weight gain at 4 weeks<sup>20</sup>, at 4-8

weeks<sup>50</sup>, at 12-20 weeks<sup>11</sup> and at 6 months<sup>50</sup> postpartum in a variety of populations. The rate of weight loss in postpartum soldiers has not been documented.

### **Eating Habits and Attitudes**

Pregnancy and lactation both result in changes in the recommended dietary allowances needed for health. Table 3 summarizes some of these requirements. There are no values reported for postpartum, non-lactating women as their nutrient requirements are assumed to quickly return to their prepregnancy standard.

Evidence indicates that significant numbers of military women fail to ingest the Recommended Daily Allowances of various nutrients, especially while in a field setting.<sup>34</sup> There has been no such documentation, however, for pregnant or postpartum soldiers.

### **Iron Status**

Iron deficiency has been recognized as a major nutritional problem in both developing and institutionalized countries, women being at greater risk for this deficiency than men. Explanations for this difference between the genders are related to the losses of iron experienced by women through monthly menstrual blood loss, as well as a tendency for women to exhibit inadequate dietary iron intake. It has been reported that the average American diet provides approximately 6-7 mg of iron/1000 kcal.<sup>16</sup> This would require a woman to ingest approximately 3000 kcal to acquire the Military Recommended Dietary Allowance (MRDA) of 18 mg of iron. This recommended allowance is increased in the pregnant woman because of fetal and placental requirements, as well as maternal erythropoietic needs and the blood loss associated with delivery. It is estimated that the pregnant woman requires approximately an additional 6 mg of iron/day during the last two trimesters, a need which cannot be reasonably met by diet alone.<sup>25</sup> This is the basis for the medical practice of routinely providing iron supplementation during the prenatal and early postpartum period, which generally occurs even in the absence of laboratory evidence of an iron deficiency.

Data from the National Health and Nutrition Examination Survey<sup>23</sup> suggest that about 5 to 10% of women aged 20 to 44 years are iron deficient. The incidence of iron deficiency among the pregnant population is felt to be higher because of increased physiologic demands. Data from the Pregnancy Nutrition Surveillance System indicate that a low hemoglobin level and/or low hematocrit is present in 4% of white women and 13% of black women during the first trimester and in 19% of white women and 38% of black women during the third trimester<sup>8</sup>. Others have estimated that a hemoglobin level of less than 110 g/L and a hematocrit of less than 0.32 occurs in one-third to one-half of pregnant women who do not use iron supplements<sup>57</sup>. However, the use of supplementation is no guarantee of iron balance if the supplementation is inadequate.

Thomsen<sup>53</sup> demonstrated a significant decline in serum ferritin in a group of 21 pregnant women who were receiving daily 18 mg doses of iron supplementation. In fact, 15 of the 21 women in his study were judged to have empty iron stores at the 38th week of pregnancy.

Despite this obvious increased need for iron, considerable controversy exists within the medical community regarding the issue of routine iron supplementation for the pregnant woman.

In fact, it has only been within the last couple of years that official policy statements suggesting levels of supplementation have been issued by such groups as the Institute of Medicine and United States Preventive Services Task Force. In 1990, the Food and Nutrition Board of the Institute of Medicine recommended a supplementation of 30mg/day for the pregnant woman after week twelve of gestation<sup>28</sup>. They further recommended additional supplementation of 60 to 120 mg of iron for those women who might be identified as anemic and iron deficient. A comparable recommendation was later issued by the Federation of American Societies for Experimental Biology<sup>22</sup> and the American College of Obstetricians and Gynecologists<sup>1</sup>. Then, most recently the United States Preventive Services Task Force presented a policy statement which was based upon a review of the clinical research on the topic<sup>55</sup>. They reported that "the evidence is insufficient to recommend for or against routine supplementation during pregnancy".

Reasons for this disagreement within the medical and scientific communities regarding the issue of iron supplementation are related to the lack of well-designed studies. Most information which is provided to support, or refute, the practice of iron supplementation are based solely upon observational investigations which did not control for any other factors that may have had an effect upon the measured variable(s). Nonetheless, the consistency of results between studies and study designs is considerable, with the majority of results suggesting strong associations between iron balance and various maternal and fetal outcomes.

Though much attention and research has been directed in recent years to answering questions regarding iron status and health of the pregnant woman, very little work has been done to examine the same issues during the postpartum period.

## **PURPOSE**

The purposes of this research include the following:

1. To determine the proportion of soldiers who return to their preconception fitness level at their first postpartum APFT.
2. To compare the distribution, incidence and risk of injury and illness between postpartum soldiers and nonpregnant, non-postpartum soldiers.
3. To compare changes in weight and body composition between soldiers and family members in the postpartum period.
4. To compare bone mineral status between late pregnant and postpartum soldiers and family members.
5. To compare nutritional status between late pregnant and postpartum soldiers and family members.
6. To compare iron and folate status among late pregnant and postpartum soldiers, late pregnant and postpartum family members, and nonpregnant, non-postpartum soldiers.

## BODY

### Subjects

Subjects for this study include active duty (AD) and family member (FM) females stationed at Ft. Lewis, Washington who receive their medical care at Madigan Army Medical Center. Those eligible for participation meet the following criteria:

*a. STUDY GROUP* - All AD females in their third trimester of pregnancy who are scheduled to remain on active duty at Ft. Lewis for at least six months postpartum.

*b. NONPREGNANT CONTROLS* - Nonpregnant female soldiers who have not had a confirmed pregnancy within 12 months of study inclusion, who are scheduled to remain at Ft. Lewis for at least six months after entering the study, and who have a negative pregnancy test at the first blood draw.

*c. FAMILY MEMBER CONTROLS* - Non military females who are in their third trimester of pregnancy who are not scheduled to move for 6 months after delivery.

Excluded from the study:

(1) any pregnant female (soldier or family member) sent to Madigan Army Medical Center for definitive OB care from the hospital's respective HSSA or Tri-service area who is not assigned or does not have a sponsor assigned to Ft. Lewis;

(2) any non-pregnant soldier who has a confirmed pregnancy within 12 months prior to study inclusion.

### Study Design

This study is a prospective cohort study enrolling 135 pregnant soldiers, 200 non-pregnant soldiers, and 135 family member controls.

### General Study Plan

We identify women in their third trimester of pregnancy through the OB-Gyn clinic and ask them to volunteer for the study. Non-pregnant soldiers are solicited through the unit chain of command. Those who meet the inclusion criteria receive written and verbal explanations as to the nature, duration, purposes, risks and benefits of the study. Volunteers sign the Agreement Affidavit and data collection begins following the schedule in Table 4.

Study subjects undergo blood draws to assess iron, folate and calcium status; anthropometric measurements to determine body composition IAW AR 600-9; dual energy x-ray absorptiometry (DEXA) to measure bone mineral density and to validate body fat percentages obtained by circumference measurements; and low back and hamstring flexibility evaluations. In addition, fitness is assessed using the last prepregnancy Army Physical Fitness Test (APFT) scores and the first postpartum APFT scores for all soldiers in the study. Medical records of all soldiers are reviewed at the six month follow-up to record all injuries and illnesses. Demographics, health habits and diet history, and exercise before, during and following pregnancy are obtained through questionnaires.

## **Materials/Outcome Measures**

### **A. Background Information**

Questionnaires obtain demographic data, a physical activity and exercise history, and a food frequency history. These are completed according to the schedule in Table 4. Study health personnel record data obtained by the OB clinic from the prenatal medical history worksheet that includes alcohol and caffeine consumption, prior reproductive health and menstrual history.

### **B. Delivery Data**

Study health personnel collect data regarding labor and delivery from the medical records. This includes the type of anesthesia, amount of blood loss, size of the placenta, pregnancy complications, mode of delivery, pregnancy outcome, infant apgar, infant weight/height, length of gestation, length of labor, infant complications, length of infant hospital stay and length of mother's hospital stay.

### **C. Injury/Illness**

We screen the medical records of all AD women in the study at the 6 month follow-up and document all injuries/illnesses that occur during the study period. Data collected include date of visit, verbatim diagnosis, body part and side affected, disposition and total limited duty days resulting from the injury or illness. We also record causes for injuries, if stated in the medical records. An injury is defined as any neuromusculoskeletal complaint that results in a visit to a medical clinic and is recorded in the medical records. An illness will be defined as a visit to the medical facility for medical attention for any reason other than an injury.

### **D. Fitness Assessment**

The Army Physical Fitness Test (APFT) scores is used as the measure of fitness. We obtain the soldier's scores from the individual's APFT card (DA Form 705) which is maintained by the soldier's unit. The last test immediately prior to conception is used to assess fitness for the 2 mile run, pushups and situps. Postpartum fitness is assessed at the soldier's first postpartum APFT. In addition, we measure low back and hamstring flexibility using the sit and reach test. This is a simple test where the subject sits on the floor with her feet flat against the front of a calibrated box, knees fully extended. She reaches forward toward her toes as far as possible without bouncing, holding the maximum reach for 2 seconds. Each subject is allowed three practices followed by three tests. The maximum reach is recorded.

### **E. Body Composition Assessment**

Body composition is determined using three methods.

1. Dual-energy x-ray absorptiometry (DEXA) soft tissue and bone mass analyses. This is done for the pregnant soldier and family member two days and six months postpartum. The non-pregnant soldiers receives the DEXA at study entry and six months later. Each subject lies supine on a DEXA scanner table in shorts and T-shirt or hospital gown. Subjects are carefully positioned so that their body is centered on the table, their hands are placed palms down, their head is horizontally aligned, and their feet and knees are supported and held together with velcro

straps so that the feet lean away from the body at approximately 40 degrees. To obtain body fat and total fat-free mass, each soldier is scanned in 1 cm slices across the body, beginning from the head, at the 10 minute scanning speed.<sup>59</sup> To obtain bone mineral density, overlapping slices across the right femoral neck and the lumbar vertebral body are done at the 4 minute and 5 minute scanning speeds, respectively.<sup>59</sup> The data will be analyzed using the Lunar software version 3.6 algorithms.

2. Body weight and height. Maternal body weights throughout gestation is taken from the medical records as measured at standard OB appointments. All other body weights are taken at follow-up visits in PT shorts and T-shirt on one calibrated weight scale. Standing height is taken using a tape measure.

3. Anthropometric measurements. We measure four circumferences (forearm, wrist, neck and hips) with a flexible fiberglass tape measure. The average of two circumference measurements for each anatomical site is recorded and body fat is computed using standard Army equations IAW AR 600-9.

#### F. Nutritional Status

Food frequency data and vitamin/mineral supplementation use is compiled according to the schedule in Table 4. The food frequency data is collected using a modified version of the Health Habits and Diet History Questionnaire, produced by Gladys Block for the National Cancer Institute.<sup>6</sup> This validated and reliable questionnaire contains an open-ended food frequency section of 60 food items which gives a semi-quantitative measurement of usual dietary intakes over a period of the previous month.

#### G. Iron, Folate and Calcium Status

Venous blood is obtained by venipuncture of a superficial vein in the antecubital region. Samples are prepared as described below. Most analyses is done by Pennington laboratories with minimal analysis being performed at the on-site hospital laboratories. Table 5 lists the tests to be performed on the collected blood and urine, and the site of analysis.

Blood is collected into vacuum tubes (3 tubes for each draw) by experienced phlebotomists at the hospital lab, using vacutainers. Two samples are collected into 10 ml SST sterile serum separation tubes. These samples are allowed to clot at 4 C for 12 to 24 hours. Sera is retained and stored at -20 C, protected from light, until assayed. One blood sample is collected into a 10 ml whole blood tube with EDTA. A 5 ml aliquot of this sample is processed for analysis of red cell folate and stored at -20 C, protected from light, until assayed. The remainder is analyzed in the local hematology laboratory for hematocrit, hemoglobin, mean corpuscular volume, and red cell mean index. Frozen samples are shipped to Pennington laboratories.

We have encountered some problems with collection, storage and shipment of blood and urine samples which include the following:

1. Near the onset of the study we noticed that the PTH (Parathyroid Hormone) values were extremely low, often near zero, regardless of study phase. Pennington labs was notified and they

performed some quality assurance testing at their site. They determined that samples were not frozen quickly enough after initial collection of blood. This is a difficult problem for us to overcome since we are dependent on the hospital's lab personnel to accomplish this. We are making frequent trips to the lab in an attempt to improve this situation.

2. We noted early on that elevated RBC folate levels were frequently reported in all catagories of subjects. Pennington labs determined that the initial procedure we were using (and one which they okayed) for preparing RBC folate was incorrect. The hospital laboratory needed to add vitamin C to the sample at a specific time in the process to lyse the RBC aliquot. Madigan's lab was unable to consistently prepare the samples in the timely manner required to ensure accurate results. We, therefore, discontinued collecting this sample for the remainder of the study.

3. Typically, after the serum is processed and frozen at the hospital laboratory, containers of blood are packaged in dry ice and shipped overnight to Pennington Labs, Louisiana. In June, 1995 a package of 16 blood samples was received at Pennington Lab on a Friday and were not noticed until Monday morning. The samples thawed and were deemed unusable. We then instituted a policy of sending out packages no later than Wednesdays. Recently, in January 1996 Federal Express lost track of a package of 24 blood samples and, again, the result was thawed blood and urine.

## **Data Analysis**

Separate analyses are planned for injuries, fitness, body composition and biochemical data. Injury incidence following return to active duty will be evaluated using contingency table analysis. Fisher's exact test will be used to compare the overall proportions with any injury for non-pregnant soldiers versus postpartum women after return to active duty. A Mantel-Haenszel test will be used to compare the groups after controlling for soldier site in the analysis of the proportions with any injury. A linear logistic model for the proportions with any injury will be used to control for covariates such as baseline PT test, race, age, and other baseline factors of interest.

Fitness will be compared within and across two study groups. Within group comparisons will be performed for the pregnant soldier and change in fitness will be assessed between the preconception and six month postpartum fitness levels using a paired t-test. Between group comparisons will be performed for the two soldier's group using an unpaired t-test. Body composition and weight change will be performed for the two pregnant subject groups and the two soldier groups using an unpaired t-test.

Biochemical markers will be compared within and across the three study groups. Within group comparisons will be performed for the pregnant study participants. For pregnant active duty soldiers, changes in biomarkers will be assessed prior to delivery, 7 weeks post-delivery, and 6 months post-delivery using paired comparisons. Paired t-tests will be used to test if biochemical levels change significantly between 7 weeks and 6 months for soldiers following delivery. For pregnant family members, changes in biochemical levels will be assessed prior to delivery and 7 weeks post-delivery using a paired comparison test. Paired t-tests (or signed rank tests) will be used for paired comparisons analyses; regression analyses will be performed to assess if pre-natal evaluations and demographic factors influence post-pregnancy outcomes.

Between-group biochemical comparisons will be performed for: (1) the two pregnant subject groups, and (2) the two soldier groups. Non-pregnant soldiers will be assessed at a single longitudinal point in time. Unpaired t-tests (or Mann-Whitney-U tests) will be used to compare groups. Data collection times will allow for comparisons between pregnant subjects at 7 weeks post-delivery and between non-pregnant soldiers and post-delivery soldiers at 7 weeks and at 6 months after delivery. The comparison between pregnant groups at 7 weeks will evaluate differences between soldiers and non-soldiers. The comparison between non-pregnant and pregnant soldiers at 7 weeks and at 6 months post-delivery will assess the ability of the pregnant soldier to recover. Unpaired t-tests will be used to test if the difference between soldier groups narrows significantly between 7 weeks and 6 months. Linear regression analysis will be used to test for 6 month group differences controlling for pre-natal history, demographics, and 7 week biochemical outcomes.

SAS (Version 6.08, Cary, NC) will be used to perform all t-tests, sign rank tests, Mann-Whitney-U tests, linear regressions, and linear logistic analyses. StatXact (Cambridge, MA) will be used to perform Fisher's exact tests and Mantel-Haenszel tests. A p-value of  $\leq 0.05$  is required for significance. No interim analyses are planned.

## **Results**

The original proposal called for data collection at two busy military hospitals, Madigan Army Medical Center, Ft. Lewis, WA, and Womack Army Hospital, Ft. Bragg, N.C. Due to contracting problems at Ft. Bragg, we were unable to hire the research assistants needed at that site in a timely manner. By extending this study until the summer of 1996, we planned on collecting data from the Ft. Lewis population only. Therefore, the sample size for this study will be less than originally planned. Table 6 lists the subject recruitment as of 15 Feb 1996 and the expected sample size. Table 7 lists the number of measurements taken for each phase of the study.

## **CONCLUSION**

Data analysis will occur at the end of the study. There are no conclusions at this time.

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## APPENDIX

**Table 1. Summary Of Military Studies Reporting Low Levels Of Fitness As A Risk Factor For Injury.**

AUTHOR	RISK RATIO*	GENDER	POPULATION
Knapik (1993) <sup>36</sup> JOM	1.60	males	Army infantry soldiers (Ft. Richardson)
Jones (1993) <sup>30</sup> AJSM	1.69 2.80	males females	Army basic trainees (Ft. Jackson 84)
Jones (1993) <sup>31</sup> Med sci	1.68	males	Army basic trainees/AIT (Ft. Benning 87)
Kimsey (1993) <sup>33</sup>	2.11 2.44	males females	Marine recruits (Parris Island)
Bell (1993) (PhD thesis)	1.95 1.46	males females	Army basic trainees (Jackson 88)

\*The ratio of the cumulative incidence (%) of injury in the low fitness population (slow run times) compared with the cumulative incidence of injury in the high fitness population (fast run times).

**Table 2. Recommended Total Weight Gain Ranges For Pregnant Women By Prepregnant Body Mass Index (BMI)(kg/m<sup>2</sup>).**

WEIGHT-FOR-HEIGHT CATEGORY	RECOMMENDED TOTAL WEIGHT GAIN	
	kg	lb
Low (BMI<19.8)	12.5 - 18	28 - 40
Normal (BMI=19.8 - 26.0)	11.5 - 16.0	25 - 35
High (BMI>26.0 - 29.0)	7.0 - 11.5	15 - 25

From the Institute of Medicine, (1990). Nutrition during pregnancy (p.10). Washington D.C.: National Academy Press

**Table 3. Recommended Dietary Allowances For Prepregnant, Pregnant And Lactating Women 15-25+ Years Old.**

	Prepregnant	Pregnant	Lactating (1-6 mos)
<b>Energy (kcal)</b>	2,220	2,500	2,700
<b>Protein (g)</b>	44-50	60	65
<b>Zinc (mg)</b>	12	15	19
<b>Magnesium (mg)</b>	280	320	355
<b>Calcium (mg)</b>	800	1200	1200
<b>Selenium ( g)</b>	55	65	75
<b>Vitamin A ( g)</b>	800	800	1300
<b>Vitamin C (mg)</b>	60	70	95
<b>Vitamin E (mg)</b>	8	10	12
<b>Niacin (mg)</b>	15	17	20
<b>Iron (mg)</b>	15	30	15
<b>Folate ( g)</b>	180	400	280

(From Food and Nutrition Board, National Research Council: Recommended Dietary Allowances. 10th Ed. Washington D.C., National Academy Press, 1989.)

**Table 4. Collection Points For Various Outcome Measures.**

	3rd trimester	D+2 days	D+7 weeks	D+6 months	D+12 months
<b>Pregnant F.M.</b>	Blood draw Demographics Exercise & food frequency survey	DEXA Blood draw Anthropometry	Blood draw Anthropometry Exercise & food frequency survey Flexibility	DEXA Blood draw Anthropometry Exercise & food frequency survey Flexibility	NA
<b>Pregnant soldier</b>	Blood draw Demographics Exercise & food frequency survey	DEXA Blood draw Anthropometry	Blood draw Anthropometry Exercise & food frequency survey Flexibility	DEXA Blood draw Anthropometry Exercise & food frequency survey Flexibility	Medical records review (monthly) APFT score
<b>Non-pregnant soldier</b>	Blood draw Demographics Exercise & food frequency survey	DEXA Blood draw Anthropometry	Blood draw Anthropometry Exercise & food frequency survey Flexibility	DEXA Blood draw Anthropometry Exercise & food frequency survey Flexibility	Medical records review (monthly) APFT score

D=delivery date

**Table 5. Proposed Tests To Be Performed On Collected Blood And Urine.**

Proposed Test		Proposed Test	
Ferritin	Serum	Erythrocyte folate	Whole blood
Total iron binding capacity	Serum	Parathyroid hormone	Serum
Iron	Serum	Differential count	Whole blood
% saturation	Serum	CBC and RBC indicies	Whole blood
Transferrin	Serum	Phosphorus	Serum/Urine
Albumin	Serum	Calcium	Serum/Urine
Folate	Serum	Creatinine	Urine
25-OH Vitamin D	Serum	Deoxypyridinoline	Urine

**Table 6. The Number Of Subjects Currently Enrolled And The Number Expected At Study Completion.**

	<b># of Subjects Enrolled</b>	<b># of Subjects Expected</b>	<b># of Subjects Originally Planned</b>
<b>Pregnant Family Members</b>	127	135	155
<b>Pregnant Soldiers</b>	135	135	155
<b>Non-pregnant Soldiers</b>	125	220	310

**Table 7. Number Of Measurements Taken For Each Phase Of The Study.**

	<b>3rd Trimester</b>	<b>D+2 Days</b>	<b>D+7 Weeks</b>	<b>D+6 Months</b>	<b>Total</b>
<b>Blood Draws</b>	311	307	196	78	892
<b>Body Fat</b>	-	330	241	61	632
<b>Flexibility</b>	-	-	234	63	297
<b>DEXA</b>	-	328	-	70	398